IMPACT OF THE Mountain Pine Beetle ON THE LOLO National Forest, MONTANA 1970

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IMPACT OF THE MOUNTAIN PINE BEETLE ON THE LOLO NATIONAL FOREST, MONTANA - 1970

by

W. M. Ciesla and M. D. McGregor
Entomologists, Division of State and Private Forestry

ABSTRACT

Biological evaluations and presuppression surveys of mountain pine beetle infestations in lodgepole and ponderosa pine stands on the Lolo National Forest yielded some data on the impact of this insect on stand structure, volume, and stocking for a 2-year period, 1969 and 1970. Volume losses ranged from a high of 193 board feet per acre to a low of 21 board feet per acre. The greatest losses occurred in a ponderosa pine stand on Ninemile Creek where 10.98 percent of the pine stems and 8.07 percent of the total stems in the stand were killed, resulting in a 11.44 percent pine volume loss and an 8.90 percent total stand volume loss. Impact on stocking was virtually negligible with four of the five stands still approaching or exceeding 200 trees per acre after 2 years of beetle activity.

INTRODUCTION

The mountain pine beetle, Dendroctonus ponderosae Hopk., is a serious insect pest of lodgepole pine, Pinus contorta; ponderosa pine, P. ponderosa; and western white pine, P. monticola, in the Northern Rocky Mountains. Infestations can develop rapidly and persist in overmature or overstocked stands resulting in considerable loss to the forest resource. Three outbreaks of the mountain pine beetle presently occur in lodgepole and ponderosa pine on the Lolo National Forest in western Montana. These are located at St. Regis on the Superior District, Ninemile Creek on the Ninemile District, and Hayes Creek on the Missoula District (Fig. 1). Biological evaluations and presuppression surveys of these infestations yielded data on the impact of these infestations on stand structure and volume.

INFESTATION HISTORY

St. Regis.--Bark beetle activity was first noted in 1964 in lodgepole pine stands on State of Montana lands in Four Mile Flats near St. Regis, Montana, when approximately 600 acres were infested. Annual tree mortality increased and in 1969, 2,200 acres of National Forest, State, and private lands were affected. Efforts in 1969 to suppress the infestation by salvage logging and felling and burning brood trees failed, probably because of an incomplete control job.

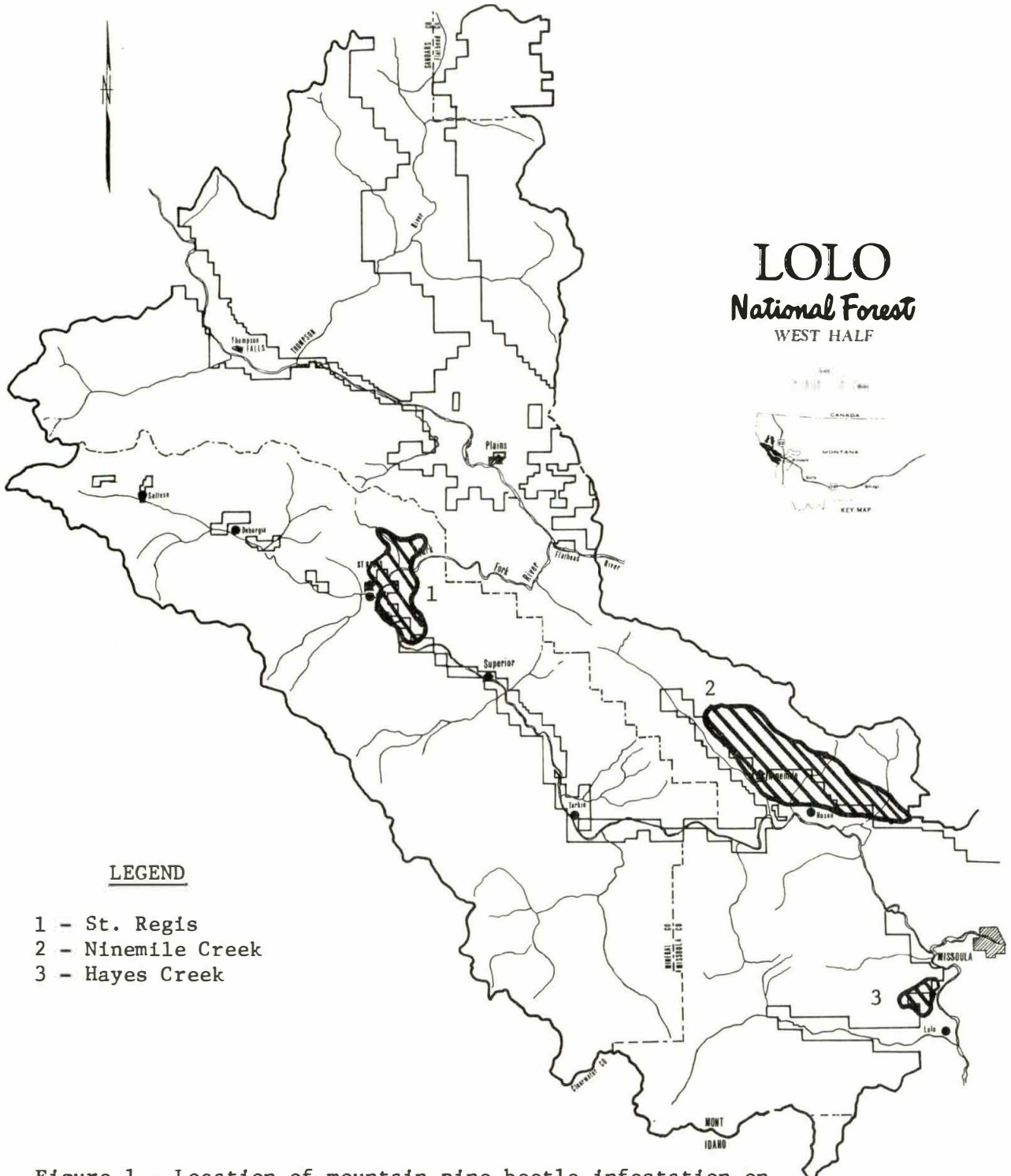

Figure 1.--Location of mountain pine beetle infestation on the Lolo National Forest, 1969-70.

Aerial and ground surveys conducted in 1970 showed that the infestation spread over 12,500 acres. New attacks were discovered in the adjoining Mill Creek and Mayo Gulch areas. A biological evaluation conducted in 1970 indicated that the infested trees contained a mixture of mountain pine beetle and pine engraver, Ips pini (Say). (McGregor and Bousfield, 1970).

Ninemile Creek.--A massive infestation of the mountain pine beetle was detected in ponderosa pine stands in the Ninemile Creek drainage in 1970 (Fig. 2). Aerial and ground surveys indicated that the infestation occurred on about 18,000 acres of National Forest land and 12,000 acres of adjoining State and private lands from Mill Creek, north of Frenchtown, Montana, northwest to Kennedy Creek.

Hayes Creek.--A localized mountain pine beetle infestation was detected in the Hayes Creek drainage near Blue Mountain on the Missoula District early in 1971. This infestation occurs in ponderosa pine approximately 80 years old (Ciesla et al. 1971).

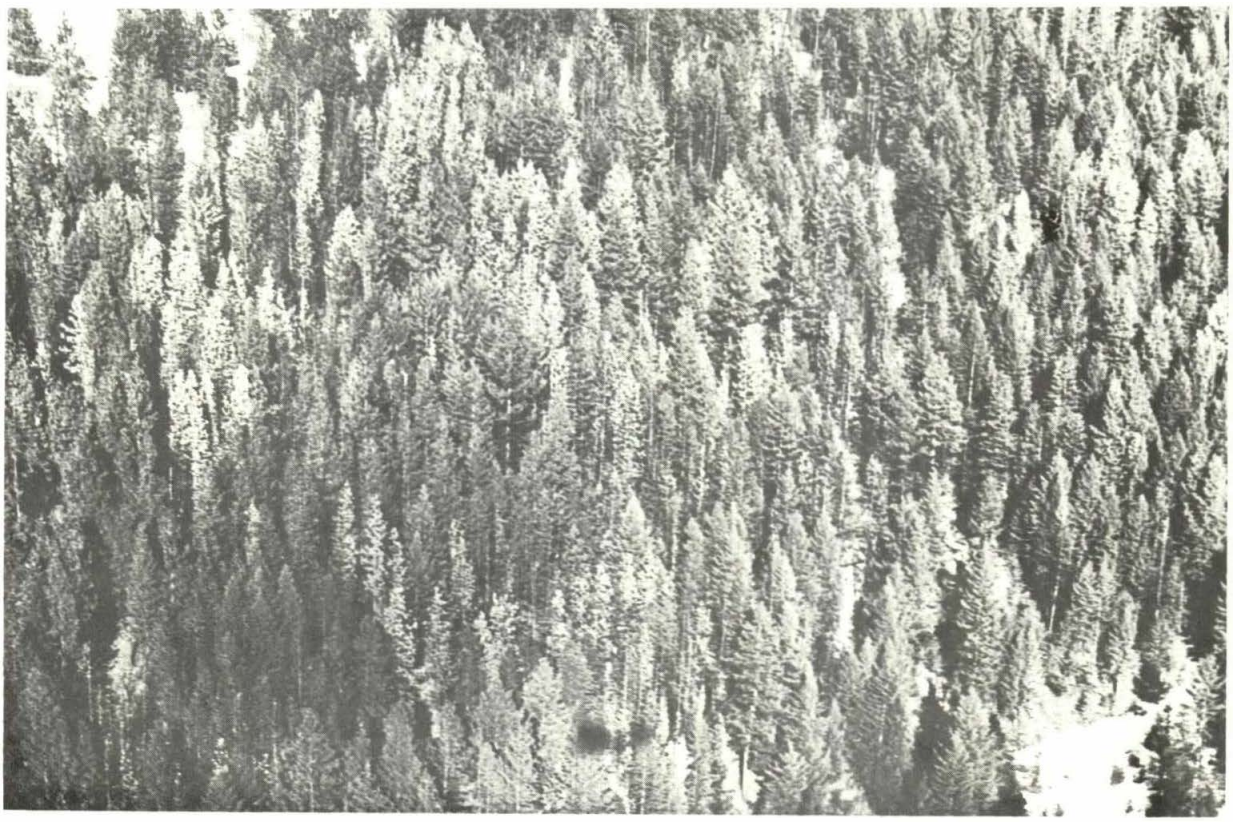

Figure 2.--Mountain pine beetle infestation in ponderosa pine stands in Ninemile Creek, Lolo National Forest. Light-colored crowns are trees which have been killed.

SURVEY METHODS

Ground surveys were conducted by personnel of the Lolo National Forest and the Montana Office of the State Forester in each outbreak area using the variable plot basal area cruise. A total of 10,184 acres were included in these surveys: 6,187 in the St. Regis infestation, 2,875 on State and private lands in Ninemile Creek, and 492 acres in Hayes Creek. Plots were located at 5-chain intervals on cruise lines 10 chains apart. A wedge prism (BA factor 10) was used to tally trees. Trees occurring in each plot were recorded as to species, d.b.h., total height, and attacked by the mountain pine beetle or green. Trees attacked by the mountain pine beetle were classified as to year of attack, 1969 or 1970. Trees attacked in 1969 were identified by the presence of green foliage and beetle brood in the cambium. Trees attacked prior to 1969 were not included in this evaluation because of the difficulty of reliably identifying attacks more than 2 years old. Survey data was analyzed by a modified ADP Region 1 timber cruise program.

RESULTS

Description of infested areas.--All of the infested areas occur at relatively low elevations--2,800 to 3,000 feet at St. Regis; 3,200 to 3,600 feet in Ninemile Creek; and 3,400 to 3,800 feet in Hayes Creek. Ecological habitat type of all three areas is predominately Douglas-fir-Nine bark. Species composition in the Ninemile and Hayes Creek areas is primarily ponderosa pine with a small proportion of Douglas-fir, lodgepole pine, and western larch. In the St. Regis area lodgepole pine, ponderosa pine, and Douglas-fir occur in roughly equal proportions with western larch forming a minor component of the stand.

Summaries of volume and stand density by species for each stand prior to bark beetle attack are presented in Table 1.

Infestation levels.--Mountain pine beetle infestation levels varied considerably from area to area. The highest level of infestation occurred in Four Mile Flats, a portion of the St. Regis infestation where 11.3 lodgepole and ponderosa pine per acre were killed during the 2-year period. The Hayes Creek infestation ranks second with 9.8 ponderosa pine per acre killed in 1969 and 1970, and Ninemile Creek third with 8.9 ponderosa pine per acre killed. Infestation levels were considerably lower in the Mayo Gulch and Mill Creek portions of the St. Regis infestation. Stand volume losses were variable, ranging from a high of 193 board feet per acre in Ninemile Creek to a low of 21 board feet per acre in Mayo Gulch (Table 2).

Impact on stand structure and volume.--Impact data was expressed in terms of the total stand (all species) and the host (pine) component of the stand. Heaviest losses in terms of both number of stems and volume occurred in Ninemile Creek where 10.98 percent of the pine component and 8.07 percent of the total stems were killed during the 2-year period. In terms of volume, 11.44 percent of the host volume and 8.90 percent of the total stand volume was lost due to mountain pine beetle during the 2 years covered by this evaluation. Damage to other stands surveyed showed a low of 0.98 percent of the host stems and 0.71 percent of the total stand volume loss (Tables 3 and 4).

Impact of beetle infestation on stand stocking is virtually negligible to date. With the exception of Ninemile Creek, stocking levels still approach or exceed 200 crop trees per acre. Stocking was reduced from 110 to 101.1 trees per acre in Ninemile Creek (Table 5).

Total volume loss attributable to the mountain pine beetle (and the pine engraver in the St. Regis area) in the area included in this survey is estimated at 815,388 board feet of ponderosa pine and 892,619 board feet of lodgepole pine in 1969 and 1970.

DISCUSSION

The data presented in this report seems to indicate that losses due to the mountain pine beetle in the areas surveyed are relatively low in spite of seemingly massive infestations.

This is particularly true when compared to similar data collected by Parker (1971) on mountain pine beetle infestations in Yellowstone National Park which show that 25.2 percent of the total stems over 5 inches d.b.h. were killed over a 5-year period, reducing stocking from 212.3 to 158.9 trees over 5 inches d.b.h. per acre. With the exception of the Four Mile Flat portion of the St. Regis infestation which has persisted since 1964, the mountain pine beetle has been epidemic in the areas surveyed for only 2 years. Additional losses will occur on an annual basis for the duration of these outbreaks.

Mountain pine beetle activity in the St. Regis area may be somewhat beneficial. Lodgepole pine typically grows in dense overstocked stands which tend to stagnate at a relatively early age. This infestation occurs in a mixed stand containing a considerable volume of Douglas-fir and some western larch. The mountain pine beetle is thinning these stands possibly resulting in accelerated growth of residual trees.

The data presented here provides only a partial insight into the total impact of mountain pine beetle on the forest ecosystem. Other resource values; i.e., esthetics, wildlife, and watershed were not considered, nor is a measurement of the increased growth on residual trees due to the thinning provided. These factors must be considered in developing inputs for a sound cost-benefit analysis of bark beetle control and the methodology must be developed to measure these values.

Table 1.--Green stand density and volume for stands infested by the mountain pine beetle on the Lolo National Forest, Montana.

Unit	Area surveyed (acres)	Species[1/]	Avg. d.b.h. (in.)	Avg. ht. (ft.)	Total stems	Stems /acre	Total volume (bd. ft.)	Volume /acre (bd. ft.)
ST. REGIS								
Mayo Gulch	1,057	LP	6	52	72,077	68.0	1,620,950	1,534
		PP	9	49	68,295	64.5	2,407,612	2,277
		WL	8	65	11,781	11.1	421,880	399
		DF	8	47	41,182	39.0	933,200	883
		All species			193,335	182.6	5,383,642	5,093
Four Mile Flat	2,560	LP	6	52	120,678	47.1	2,637,990	1,031
		PP	7	44	221,490	86.5	6,089,504	2,379
		WL	7	64	28,268	11.0	843,731	330
		DF	6	47	279,279	109.1	3,940,228	1,539
		All species			649,903	253.7	9,571,225	5,279
Mill Creek	3,200	LP	7	56	72,191	22.6	2,298,665	718
		PP	8	53	281,615	88.0	6,296,113	1,968
		WL	7	64	117,008	36.6	2,432,381	757
		DF	8	54	337,029	105.3	7,352,562	2,298
		All species			807,843	252.5	18,379,721	5,741
NINEMILE CREEK								
(State and Private)	2,875	LP	9	40	288	0.1	8,625	3
		PP	8	43	232,587	80.9	4,841,500	1,684
		WL	8	49	5,175	1.8	117,875	41
		DF	8	42	78,775	27.4	1,265,000	440
		All species			316,816	110.0	6,233,000	2,168

TABLE 1
(Cont.)

Unit	Area surveyed (acres)	Species[1/]	Avg. d.b.h. (in.)	Avg. ht. (ft.)	Total stems	Stems /Acre	Total volume (bd. ft.)	Volume /acre (bd. ft.)
HAYES CREEK	492	PP	7	44	98,722	200.7	1,124,259	2,285
		DF	8	41	20,522	41.7	329,823	670
		WL	-	--[2/]	469	.9	23,943	49
		All species			119,713	243.3	1,478,025	3,004

1/ Species code: LP = lodgepole pine, PP = ponderosa pine, WL = western larch, DF = Douglas-fir.

2/ Data not available.

Table 2.--Mountain pine beetle losses by species and year, Lolo National Forest, 1969-70.

UNIT	Area surveyed (acres)	Species	Year attacked	Avg. d.b.h. (in.)	Avg. ht. (ft.)	Total stems killed	Stems /acre	Total volume loss (bd. ft.)	Volume loss/ acre (bd. ft.)
ST. REGIS									
Mayo Gulch	1,057	LP	1969	6	53	1,305	1.2	15,847	15
		PP	1970	14	60	70	.1	6,334	6
		TOTAL				1,375	1.3	22,181	21
Four Mile Flat	2,560	LP	1969	6	54	15,801	6.2	434,003	170
			1970	6	57	9,450	3.7	255,210	100
		PP	1969	7	52	2,590	1.0	50,651	20
			1970	8	52	1,134	.4	27,265	11
		TOTAL				28,975	11.3	767,129	301
Mill Creek	3,200	LP	1969	5	54	1,174	0.4	14,570	5
			1970	8	63	3,602	1,1	172,989	54
		PP	1969	7	53	8,317	2.6	95,945	30
			1970	9	58	1,720	.5	50,678	16
		TOTAL				14,813	4.6	334,182	105
NINE MILE CR.									
(State and Private)	2,875	PP	1969	8	48	9,488	3.3	152,375	53
			1970	7	44	16,100	5.6	402,500	140
		TOTAL				35,588	8.9	554,875	193
HAYES CREEK	492	PP	1969	6	34	1,077	2.2	13,733	28
			1970	7	44	3,739	7.6	15,907	32
		TOTAL				4,814	9.8	29,640	60

Table 3.--Proportion of stems killed by the mountain pine beetle by species and year, Lolo National Forest, 1969-70.

UNIT	Species	Year	Percent of host stems killed	Percent of total stand killed
ST. REGIS				
Mayo Gulch	LP	1969	0.93	0.67
	PP	1970	.05	.04
	TOTAL		0.98	0.71
Four Mile Flat	LP	1969	4.62	2.43
		1970	2.76	1.45
	PP	1969	.76	.39
		1970	.33	.17
	TOTAL		8.47	4.44
Mill Creek	LP	1969	0.33	0.15
		1970	1.01	.45
	PP	1969	2.35	1.02
		1970	.49	.21
	TOTAL		4.18	1.83
NINE MILE CREEK				
(State and Private)	PP	1969	4.07	2.99
		1970	6.91	5.08
	TOTAL		10.98	8.07
HAYES CREEK	PP	1969	1.09	0.89
		1970	3.79	3.12
	TOTAL		4.88	4.01

Table 4.--Proportion of volume killed by the mountain pine beetle by species and year, Lolo National Forest, 1969-70.

UNIT	Species	Year	Percent of host volume killed	Percent of total stand volume killed
ST. REGIS				
Mayo Gulch	LP	1969	0.39	0.29
	PP	1970	.16	.12
	TOTAL		0.55	0.41
Four Mile Flat	LP	1969	4.46	3.22
		1970	2.93	1.89
	PP	1969	.59	.35
		1970	.32	.21
	TOTAL		8.30	6.08
Mill Creek	LP	1969	0.19	0.09
		1970	2.01	.94
	PP	1969	1.12	.52
		1970	.59	.28
	TOTAL		3.91	1.83
NINE MILE CREEK				
(State and Private)	PP	1969	3.14	2.44
		1970	8.30	6.46
	TOTAL		11.44	8.90
HAYES CREEK	PP	1969	1.22	0.93
		1970	1.40	1.06
	TOTAL		2.62	1.99

Table 5.--Impact of the mountain pine beetle on stocking Lolo National Forest - 1969-70.

UNIT	Total green stems /acre at the beginning of 1969	Stems/acre killed 1969+1970	Stocking of residual stand at end of 1970
ST. REGIS			
Mayo Gulch	182.6	1.3	181.3
Four Mile Flat	253.7	11.3	242.4
Mill Creek	252.5	4.6	247.9
NINE MILE CREEK			
(State and Private)	110.0	8.9	101.1
HAYES CREEK	243.3	9.8	233.5

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